SKETCH OF THE GEOLOGY OF THE SALINAS VALLEY, CALIFORNIA[1]

In June and July 1900, under the direction of Dr. J. C. Branner, Mr. L. D. Mills and the writer undertook to trace out and map the formations in Monterey county, California, which appear to bear directly on the underground water supply of the Salinas Valley. During this and two subsequent trips to the same region the data were collected which form the basis of the present paper.

The Salinas Valley is a long, sword-shaped depression extending nearly southeast from Monterey Bay, to and across the southern end of Monterey county. The larger tributaries of the Salinas River run for a good part of their length in troughs parallel to the main valley, forming with it part of a remarkable series of valleys existing in the Coast Ranges of California, which for a distance of nearly five hundred miles are almost exactly parallel. In the Salinas Valley are evidences of a fault in the older rocks extending very persistently for several miles parallel to the main valley.

In its northern part, if not throughout its whole length, the Salinas Valley is cut in granite and other crystalline rocks, principal among which are biotite schists with crystalline limestone lying unconformably on them. The granite is intruded into the schists and is apparently the agent which metamorphosed the limestone. The granites, gneisses, and schists cover large areas while the limestone occurs only in patches. Of the crystalline rocks other than those mentioned there is one area of an eruptive that looks like andesite on top of the water-shed between Monterey and San Benito counties, northeast of the town of Salinas, and an area in the neighborhood of Metz containing a variety of intrusive and eruptive rocks in addition to several kinds of metamorphics. Hand specimens of these have been collected

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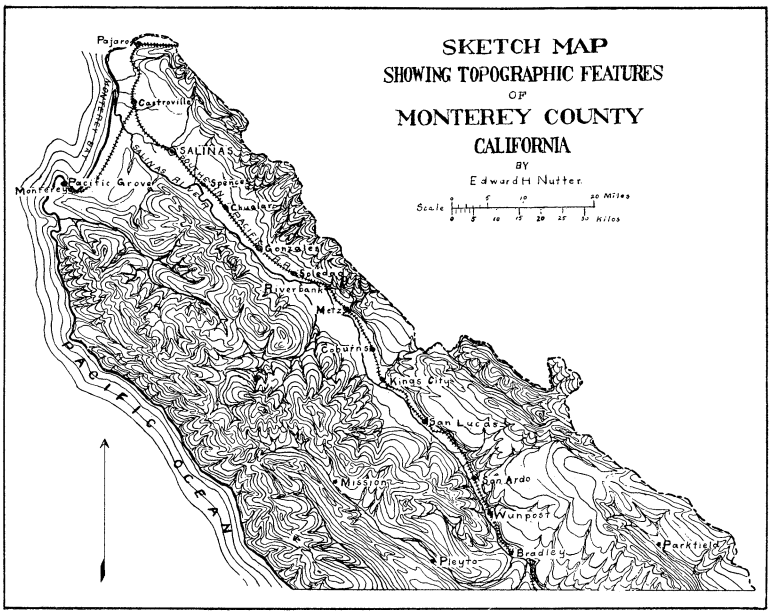
but have not yet been identified. There is also an extensive area of serpentine along the southeastern boundary of Monterey county.

Since it was cut out the Salinas Valley has been filled with sediments of Tertiary and later age. If there are sediments older than the Miocene and newer than the metamorphics, they

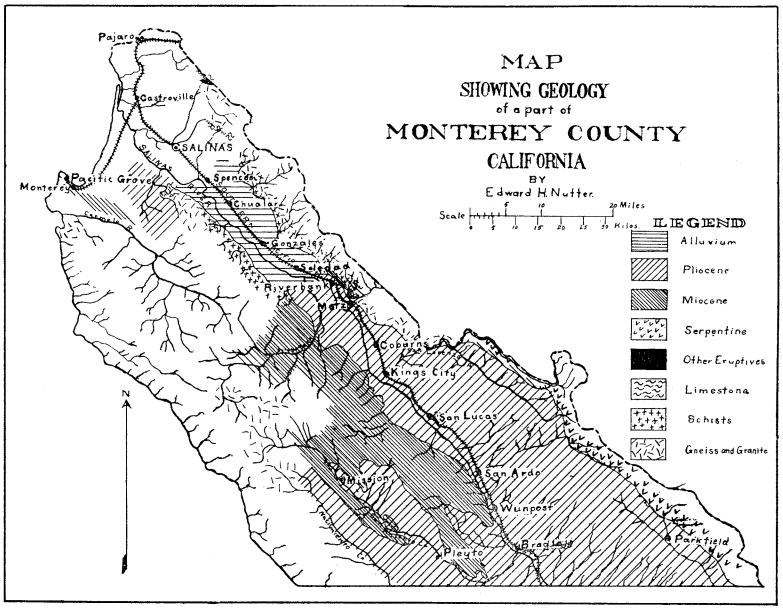


are not uncovered at any place visited, with the exception perhaps of a small area about the headwaters of the San Lorenzo River near the county line, where there are rocks resembling the Franciscan cherts. The Tertiary rocks are of Pliocene and Miocene ages, and these are separated by an unconformity.

Southeast from the town of Salinas the valley narrows down from a broad rolling plain to a sloping floor about eight miles wide, bounded on each side by granite mountains. Southwest of Salinas, across the river, are highlands formed of Pliocene[1] sands and gravels, and deeply scored by ravines.

[1] The age of these beds was determined by Mr. Ralph Arnold, of Stanford University, from fossils collected by the writer fourteen miles east of Monterey, in the center of section 20, 16 south, 3 east.

From Spence's to a few miles southeast of Soledad the floor of the valley is covered by material washed in from the granite hills and mountains on either side. This alluvium or granite wash is very porous, and this has given rise to topographic features characteristic to this part of the valley. In the rainy season the water rushes out of the steep canyons bearing a heavy burden



of sediments until it reaches the floor of the valley, where it sinks, leaving sand, gravel, mud and drift strewn around over the place where it disappeared. This has gone on until alluvial cones have been built up several miles wide and of considerable thickness. These alluvial cones or fans have themselves been cut by smaller gulches having steep sides and flat bottoms. A rudely stratified earthy conglomerate, the pebbles of which are angular fragments of granite, schist and gneiss, varying in size from sand grains to pieces the size of one's head, is usually found capping these fans.

It seems probable that both Pliocene and Miocene sediments underlie the alluvium, for they occur at the northwestern end of

this area and dip under it at the southeastern end below Soledad. In addition to this, there is a point of granite projecting through one of the alluvial fans about two and one half miles east of Gonzales in 16 south, 3 east, section 14, southeast quarter. The top of this granite exposure is capped with shale that has all the appearance of the diatomaceous Miocene shale. It seems probable that the structure of this region is that shown in the accompanying section (Fig. 1).

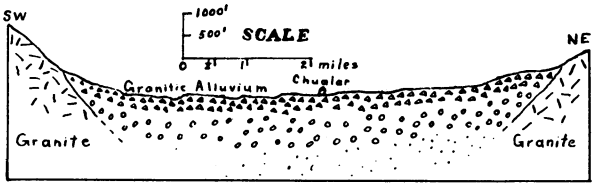


FIG. 1.— Ideal section across the Salinas Valley showing its probable structure at Chualar.

Beginning near Riverbank on the east, and at a point about six miles southwest of Soledad, on the west, water-worn gravels of Pliocene age begin to crop out from beneath the granitic talus, and gradually rise and form a terrace that extends eastward for about eighteen miles from Kings City to a series of anticlinal valleys which form the eastern boundary of the terrace or plateau.

Serpentine is abundant along the eastern edge of the terrace, though whether or not it forms a continuous sheet as indicated by the accompanying sketch map is not now known, for the part-

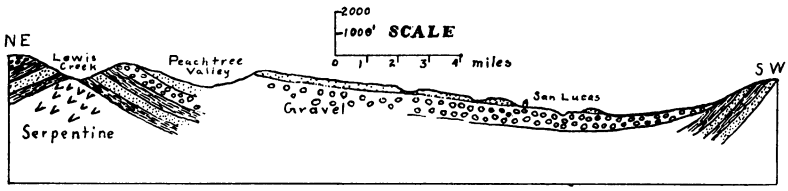


FIG. 2.— Structure of the Salinas Valley and adjoining plateau along a northeast-southwest line through San Lucas.

ing was not followed continuously, but was visited only at such places as the roads permitted. At these points serpentine was found underlying the Pliocene plateau. The edge of contact between the Pliocene beds and the underlying serpentines

reaches an elevation of nearly two thousand feet above Kings City from near Parkfield northwest to a point fifteen miles east of Kings City.

The structure of the country between Kings City and the alluvium covered district is shown by (Fig. 3) a section through Metz.

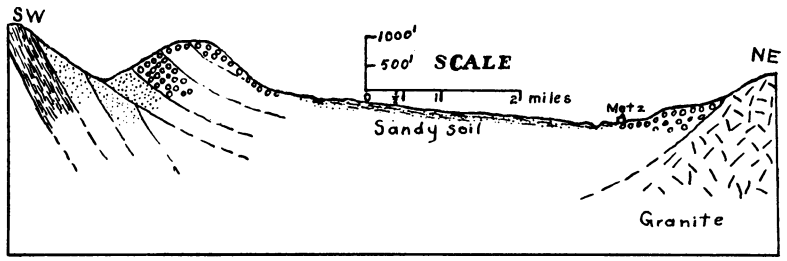


FIG. 3.—Structure of the Salinas Valley along a northeast-southwest line through Metz.

From Kings City to the San Luis Obispo county line the Pliocene beds form the eastern escarpment of the immediate valley with an average height of about one hundred feet above the river. The lower beds extend entirely under the valley, thereby making the terrace area or plateau tributary to its underground water supply.

For the most part the Pliocene beds overlie the Miocene, but in some places they lie directly on the older rocks (Fig. 4).

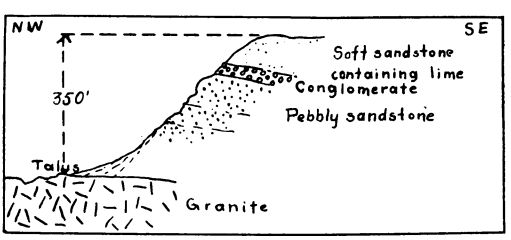


FIG. 4.—Croppings of terrace beds five miles northeast of Kings City at the head of the Salinas Valley Water Company's ditch, on the San Lorenzo River.

In the southern part of Monterey county there have been at least two elevations of the land since the deposition of the Miocene beds, for the Pliocene gravels forming the large plateau are to a great extent composed of shale pebbles, and these same pebble beds have been tilted along with the underlying beds of shale. In places the Pliocene and Miocene may be conformable.

This seemed to be the case near the southernmost point of the Miocene area shown on the accompanying geological sketch map. Here the gravels and sands rest on the sandstones and shales and have apparently the same dip and strike. For the most part, however, along the parting between the Pliocene and the Miocene, there is such a marked difference in the dip of the two series on either side of the contact, as to make almost certain an erosion line between them.

The Miocene shales and sandstones are much contorted, and

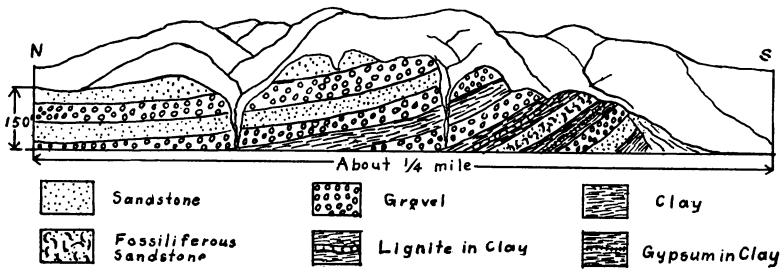


FIG. 5.—Terrace beds exposed in a railway cut three miles northwest of Bradley.

are characterized by steep dips, sometimes vertical. The Pliocene sands and gravels[1] have much gentler dips and are also persistently characterized by having a capping of soft limy sandstone.

The ranges of hills lying between the Nacimiento and San Antonio creeks, and the San Antonio Creek and the Salinas River are made up almost entirely of Miocene sandstones and shales; while the valleys of the Nacimiento and San Antonio are filled with the Pliocene sands and gravels.

There is much granite and gneiss in the region drained by the head waters of the Arroyo Seco, the San Antonio, and the Nacimiento, as the beds of these streams are filled with pebbles and bowlders made up of these rocks.

[1] The age of this Pliocene area was determined by fossils collected in a railway cut three miles northwest of Bradley. The Miocene fossils are from shale beds outcropping on the southwest bank of the Salinas River at Wunpost. They were all identified by Mr. Ralph Arnold.

RECAPITULATION

The Salinas Valley in Monterey county is a trough that probably holds a great deal of water. In its northern part from near Riverbank to some point between Chualar and Salinas it is covered with talus washed in from the mountains.

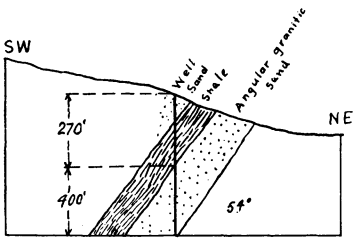


FIG. 6.—Sand and shale beds at Barrett's oil well, four miles northwest of Parkfield. Water was encountered at two levels in the angular granitic sand. The elevation of the mouth of the well is 1800 feet above Kings City.

Pliocene and Miocene sediments underlie this talus though to what extent is uncertain. Going southward the Pliocene beds rise from beneath the talus at about Riverbank; and from east of Kings City, to the southward, they form an extensive plateau which continues into San Luis Obispo county and is probably tributary to the underground water supply of the Salinas Valley.

In the drainage area of the San Antonio and Nacimiento creeks there are also Pliocene gravels which are indirectly tributary to the underground water supply of the Salinas Valley.

It seems probable that deep wells put down near the western margin of the Pliocene terrace between San Lucas and the San Luis Obispo county line may yield considerable water, perhaps artesian.

Slightly salty water has been found in wells in the terrace beds above the valley, though there are folds lying between these bore holes and the valley (Fig. 6).

It is possible that artesian water may be found in the region of the San Antonio and Nacimiento creeks, but not enough detailed work has been done there to warrant any definite conclusions upon the subject at present.

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